Tropical Starches from South-East Asia (2): Evaluation of noodles mechanical properties in relation with gel texture and stability under refrigerated and frozen conditions

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Keywords: Tuber starches, Texture, Noodles, Refrigeration, Frozen stability

Abstract:
Several starch-producing plants are grown in South-East Asia, from which starch is extracted at small scale for local use. This study undertakes to identify properties specific to some of these starches in model food systems, in order to demonstrate their potential as food ingredients and thereby encourage the development of economic activities related to their production and use. Selected starches were canna, mungbean, sago, kudzu, taro and yam bean, and were sourced from Vietnam or Thailand. Cassava, rice and maize starches were also included as references. The different starches showed distinct behaviors in terms of gel texture, noodle texture, expansion ability and syneresis under refrigerated and frozen conditions.
Mungbean and canna gave hard gels with high compressive strengths (13000-30000kg/m^2), whereas taro, yam bean, kudzu, rice and maize gave much softer gels with compressive strengths below 6000 kg/m^2. Compressive strains at peak force evidenced further differences between starches, with sago and taro able to undergo large (0.47-0.50), mungbean, canna and yam bean intermediate (0.35-0.44), and kudzu only small (0.20) deformations. Hence different types of starches can create a range of gel textures, from soft to hard and from fairly brittle to more cohesive. In particular, canna and mungbean formed unusually hard gels, compared to commonly used starches such as rice and maize.
Noodles prepared from canna and mungbean were fairly rigid with high tensile strengths (4000-10000kg/m^2) and low strains at break (0.2-0.4), while noodles from kudzu, sago and cassava were soft and extensible with low tensile strengths (1340, 1590, 430 kg/m^2, respectively) and either intermediate (kudzu, sago) or high (cassava) strains at break (0.63, 0.94, 1.21, respectively). Noodles made of cassava blended with other starches showed mechanical properties intermediate between those of the pure starches, which raised the question of starch compatibility and blend morphology in systems using different starches together.

Syneresis studies indicated that sago starch gels had the best stability under refrigerated conditions (syneresis below 2%), while mungbean and canna starch gels were more efficient for retaining water after five freeze-thaw cycles (7-9% and 22-25% syneresis respectively).